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Patent claims

1. Electrochemical battery cell having

a negative electrode, an electrolyte containing a conductive salt, and a positive electrode,

wherein

the electrolyte is based on SO_2 and

an intermediate space between the positive electrode and the negative electrode is arranged and adapted such that active mass deposited on the negative electrode during the charging of the cell may come into contact with the positive electrode in such way that locally limited short-circuit reactions occur at its surface.

2. Battery cell according to Claim 1,

wherein a porous insulator layer runs adjacent and parallel to the positive electrode, which is arranged and formed such that it is possible for active mass deposited on the negative electrode to grow during the charging of the cell through the pores of the insulator layer up to the surface of the positive electrode.

3. Battery cell according to Claim 1 or 2,

wherein the negative electrode is adapted for taking up positive metal ions of the conductive salt into its interior during charging of the cell.

4. Battery cell according to Claim 3,

wherein the negative electrode comprises an electrically conductive electrode mass into which the metal ions of the conductive salt are taken up during charging of the cell and the porous insulator layer is

located between the electrically conductive electrode mass of the negative electrode and the positive electrode.

5. Battery cell according to Claim 4,

wherein the electrically conductive electrode mass of the negative electrode contains carbon.

6. Battery cell according to Claim 2,

wherein the negative electrode has a planar, electronically conductive substrate and a nonconductive deposition layer bonded to the substrate, the deposition layer being formed and arranged such that active mass deposited on the surface of the substrate penetrates into its pores and is deposited further therein and

no barrier layer impermeable to the active mass is located between the deposition layer and the positive electrode, the porous insulator layer being formed by the deposition layer or being a separate layer.

7. Battery cell according to Claim 2,

wherein the porous insulator layer contains a particle-shaped, fiber-shaped or tube-shaped pore structure material.

8. Battery cell according to Claim 7,

wherein the pore structure material contains an oxide, a carbide, or a chemically stable silicate.

9. Battery cell according to Claim 2,

wherein the porous insulator layer contains a binder based on a terpolymer of tetrafluoroethylene, hexafluoropropylene, and vinylidene fluoride.

10. Method for manufacturing an electrochemical battery cell, which has a positive electrode and a negative electrode in a housing, in particular a battery cell according to one of the preceding claims,

wherein

hydroxide ions are removed from the surface of an electrode for optimization thereof,

a cleaning agent which contains a first cleaning component reacting with hydroxide ions is contacted with the electrode such that hydroxide ions bonded thereto are removed from the electrode surface due to a reaction with the first cleaning component, and

components of the cleaning agent or reaction products which may interfere with the function of the cell are removed from the electrode.

11. Method according to Claim 10,

wherein the first cleaning component is a proton-free Lewis acid.

12. Method according to Claim 11,

wherein the proton-free Lewis acid is selected from the group comprising AlF_3, BF_3, CO_2, CS_2 and $GaCl_3$.

13. Method according to any one of Claims 10 to 12,

wherein the electrode is an insertion electrode, preferably an intercalation electrode.

14. Method according to Claim 13,

wherein a cleaning agent which contains a second cleaning component reacting with H^+ ions is contacted with the insertion electrode such that H^+ ions bonded therein are extracted from the electrode due to a reaction with the component.

15. Method according to any one of Claims 10 to 14,

wherein the second cleaning component is a salt which makes an ion exchange reaction with H^+ ions which are bonded to the insertion electrode.

16. Method according to Claim 15,

wherein the salt is a halogenide, preferably a fluoride of an alkali metal, an alkaline earth metal, or an element of the third main group of the periodic system, in particular LiCl or LiF.

17. Insertion electrode, preferably intercalation electrode, for an electrochemical battery cell, in particular for a battery cell according to any one of Claims 1 to 9, having an electrode surface which is essentially free of hydroxide ions.

18. Insertion electrode according to Claim 17, which is essentially free of H^+ ions.

19. Electrochemical battery cell, in particular according to any one of Claims 1 to 9, containing an electrode according to Claim 17 or 18.

20. Method for manufacturing an electrochemical battery cell having a positive electrode and a negative electrode in a housing in particular according to Claim 12, the method comprising a step in which an SO_2-based electrolyte solution containing a conductive salt is transferred into the housing, the transfer of the electrolyte solution including the following partial steps:

- the interior of the housing is filled with gaseous SO_2;
- a fill opening of the housing is attached in a gas-tight manner to a vessel which contains the electrolyte solution having an SO_2 concentration such that the gaseous SO_2 is readily dissolved in the electrolyte solution; and
- the electrolyte solution is transferred into the housing, driven by the partial vacuum resulting from the dissolving of SO_2 in the solution.

21. Method according to Claim 20,

wherein the conductive salt is $LiAlCl_4$ and the SO_2 concentration of the electrolyte solution corresponds to at most $LiAlCl_4 \times 3.5\ SO_2$.

22. Method for manufacturing an electrochemical battery cell having a positive electrode and a negative electrode and a housing, in particular according to any one of Claims 10 to 16 and 20 to 21, the method comprising a step in which an SO_2-based electrolyte solution containing a conductive salt is transferred into the housing, wherein a cover layer containing the active metal of the cell is formed on the negative electrode after the transfer of the electrolyte solution,

the method further comprising a step in which, for optimization of the cell with respect to reduction of its discharge capacity caused by the formation of the cover layer, active metal required for the formation of the cover layer is transferred to one of the electrodes from a reserve supply, wherein

- the reserve supply is in contact with the electrolyte solution,
- an auxiliary electrode is in electrical contact with the electrolyte solution,
- an electrical line connection is provided between the auxiliary electrode and the electrode to which the active metal is to be transferred, and
- the transfer of the active metal from the reserve supply to the electrode is caused by an electrical current flowing between the auxiliary electrode and the electrode to which the active metal is transferred.

23. Method according to Claim 22,

wherein the reserve supply contains active metal in metallic form.

24. Method according to Claim 22,

wherein the reserve supply contains the active metal in a compound.

25. Method according to Claim 24 for producing a cell whose active metal is an alkali metal A, in which the reserve supply is a dithionite $A_2S_2O_4$ of the alkali metal.

26. Method according to Claim 22,

wherein the reserve supply includes an additional quantity of the electrolyte.

27. Method according to any one of Claims 22 to 26,

wherein the line connection between the electrode to which the active metal is to be transferred and the housing is such that an electrically conductive part of the inner wall of the housing forms the auxiliary electrode.

28. Method according to any one of Claims 22 to 27,

wherein the electrode to which the active metal is transferred is the negative electrode and the transfer occurs before the first charge of the cell.

29. Method according to any one of Claims 22 to 28,

wherein the electrode to which the active metal is transferred is the positive electrode,

the transfer occurs after the cell has been charged at least partially for the first time, with formation of a cover layer containing the active metal on the negative electrode, and

the supply of the active metal to the positive electrode at least partially compensates for the reduction of its content of active metal caused by the preceding charging.

30. Battery cell according to Claim 1 or 19, or method according to any one of Claims 10, 20, or 22,

wherein the active metal is selected from the group comprising the alkali metals, the alkaline earth metals, and the metals of the second secondary group of the periodic system.

31. Battery cell or method according to Claim 30,

characterized in that active metal is lithium, sodium, calcium, zinc, or aluminum.

32. Battery cell according to Claim 1 or 19, or method according to one of Claims 10, 20, or 22,

wherein the positive electrode contains a metal oxide.

33. Battery cell or method according to Claim 32,

wherein the positive electrode contains an intercalation compound.

34. Battery cell or the method according to Claim 33,

wherein the positive electrode contains an intercalation compound comprising CoO_2.